Argumentative knowledge construction in asynchronous calculus discussion boards

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A Focus on Mathematical Discourse in Asynchronous Discussion Boards

Classroom discourse constitutes a fundamental activity in which learners can acquire knowledge. A multifaceted phenomenon, any enacted classroom discussion entails the enmeshment of social, cultural, curricular, and modality factors. Focusing specifically on discourse in the context of mathematical discussion activities in the asynchronous online modality, we propose use of Weinberger and Fischer's (2006) *Argumentative Knowledge Construction* framework for design research. We contend that this framework, suitably amended to meet the particular needs of mathematics courses, may enable in-depth analysis of major dimensions of students' knowledge construction as they engage in activities in an asynchronous modality. Research using this framework in the context of face-to-face mathematical learning (Author, Date) and in online settings in other disciplines (Schrire, 2006; Clark & Sampson, 2008; Dubovi & Tabak. 2020) has been reported.

Dimensions to Argumentative Knowledge Construction

Weinberger and Fischer proposed that computer-supported collaborative learning could be analyzed according to four dimensions: *participation, epistemic, argument,* and *social modes of co-construction* (Weinberger and Fischer, 2006).

The *participation dimension* examines the quantity and heterogeneity of students' contributions to the discussion board for each discussion activity. The *epistemic dimension* focuses on the content of students' contributions, attending particularly to the degree to which students' contributions adequately relate the particulars of a problem with the intended concepts that the problem engages. The *argument dimension* derives from Toulmin's (1958) model of arguments to qualify the types of micro and macro argument moves put forth by students in pursuit of a solution. Finally, the *dimensions of social modes of co-construction* "describe to what extent learners refer to contributions of their learning partners" (Weinberger & Fischer, 2006, p. 77). In an asynchronous modality, participants' textual, imagistic, and video submissions can be retroactively analyzed to build group-by-group comprehensive accounts of the knowledge construction associated with a particularly designed prompt.

Use of the AKC Framework for Design Research

We intend to adapt Weinberger and Fischer's (2006) AKC framework in order to conduct design research in asynchronous online mathematics courses. In the theoretical poster herein proposed, we will diagrammaticaly present the dimensions of the AKC framework as conceived by Weinberger and Fischer. We will also identify aspects of the framework that we believe to require adaptation to suit the needs of mathematics-specific courses, will present various pilot discussion prompts, and will invite critique and commentary regarding our proposed use of this framework for our purposes.

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